Instructions 2AS/A Ambience Synthesizer

The 2AS/A is a dual channel analog delay unit that uses MOS bucket brigade devices. The 2AS/A features internal (and provision for external) voltage controlled delay time, adjustable recirculation and cross channel mixing for control of reverberation time and front–rear incoherence, conventional reverberation output for musical instruments, ability to handle a wide range of input and output levels, mode mixing, and overload indication. The 2AS/A has been designed for use in music reproduction systems as an ambience synthesizer. When properly set up it is capable of producing a realistic sensation of spaciousness which the user may tailor to his/her taste. Its voltage controlled clock and mixing capabilities allow it to be configured in a number of ways for delay effects such as phasing, flanging, chorus, and vibrato. External voltage control for special effects must be supplied by the user. The kit includes the circuit boards, components, chassis, cover, 12 VAC power supply, and complete assembly instructions.

Specifications
(typical unit)

input impedence	15KΩ Now 27KΩ
VCO input impedence	1MΩ
dynamic range	48dB
delay bandwidth	5.5KHz
power consumption	<5W
size	11½" x 10" x 4"
weight	6½ lbs.

Control Capabilities

time delay (t_d)	voltage controlled from approx. 1mS to 100mS +12V to 0V
recirculate	zero to oscillation
cross mix	zero to oscillation
direct-delayed mix at reverb out	zero to 1:1 (depends on input signal level)
mode mix	zero to 1:1 between $4/6t_d$, $5/6t_d$, $6/6t_d$

Applications

— ambience synthesis in home or professional music reproduction systems

— reverberation for musical instruments such as electric guitar or synthesizer—may also be used in small amounts to liven up excessively "dry" recordings in 2 channel systems.

— chorus, vibrato, phasing, and flanging effects with external voltage control

* These specifications are rough ly the best that can be expected. Both distortion and noise will increase as delay, recirculation, and cross mix are increased.

Assembly

The quality and performance of the finished kit is largely dependent on the care with which it is assembled. If you have never assembled an electronics kit before you should either seek the assistance of an experienced kit builder or postpone the assembly until you have become familiar with the identification of electronic components and basic principles of electronics. You may find it helpful to put a check in the parentheses after each instruction step has been completed.

( ) 1. Clean the 3 printed circuit boards with a piece of Scotchbrite® to remove any traces of oxidation. Wash the boards in soap and water to remove grease and the residue of the Scotchbrite®. Scotchbrite® is a registered trademark of the 3M Company.

( ) 2. NOTE: DO NOT REMOVE ANY OF THE INTEGRATED CIRCUITS FROM THE BLACK CONDUCTIVE FOAM UNTIL INSTRUCTED TO DO SO.

Using the parts list and the printing on the component side of the boards, locate and install all bare wire jumpers on both AS-A1 boards. There are 25 jumpers on each circuit board. The jumpers are made by stripping the insulation off the small gauge solid wire. The jumpers should lie flat and straight on the circuit board. Trim the jumpers on the foil side of the circuit so that 1/16" to 1/8" of wire remains and bend the leads flush with the foil.

Alternately, you may choose to install and solder each jumper and component individually without bending the leads against the foil. This makes it easier to remove components should there be a mistake or component failure. If you choose not to trim and bend the leads before soldering, you should install the component, complete the solder joints, then trim the leads flush with the tops of the solder joints. A pair of large, flat faced toenail clippers makes neat flush cuts of component leads.

( ) 3. Solder all of the jumpers. Make all solder joints with a 30 to 50 watt iron using the solder supplied with the kit or an equivalent 60/40 alloy resin core solder. Do not use acid core solder or any type of paste flux. We will not guarantee or repair a kit assembled with acid core solder or paste flux.

( ) 4. Install all 1/4 watt resistors. All resistor bodies should lie flat on the circuit board. Bend the leads to fit the hole spacing so that strain is not put on the body of the resistor. Trim and bend the leads as before and solder all connections.

( ) 5. Install all capacitors. Make certain that the orientation of the tantalum capacitors agrees with the polarity printed on the board. Note that the capacitors with tubular bodies lie flat on the board while the ceramic disk and dipped tantalum capacitors stand upright with the leads bent carefully at right angles near the body of the capacitor. Bend the leads of each capacitor to fit its hole spacing so that strain is not put on the body of the capacitor. See Figure 1 below. Trim and bend the leads as before and solder all connections.

except C-48 = 0.1 uF ceramic "100 NS"

NOTE: Jumper J15 has been omitted

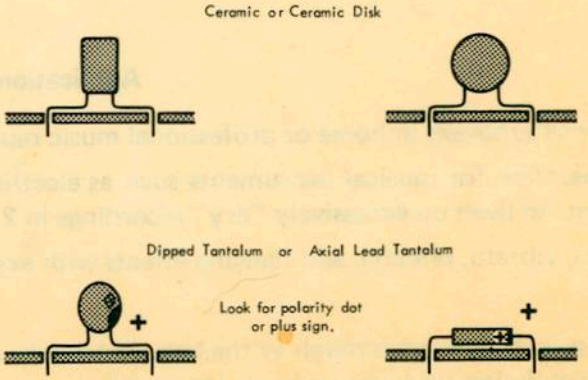

FIGURE 1
CAPACITOR INSTALLATION

R 50 R51 R52 R53

6. Install the 5 trimpots, R45, R46, R47, R48, and R94. All trimpots should stand vertically with their bases flush with the circuit board. Do not attempt to trim or bend the leads of the trimpots. R94 should face away from the circuit. Solder all connections.

7. Before installing the male Molex wafer connectors, orient each one as shown in the pictorial and carefully pull the indicated pin from the body of the connector with a pair of pliers. Do not disturb any of the other pins. Push a nylon blocking pin into the corresponding hole in each female Molex connector shell. Always orient the ramp of the female connector up for making reference to contacts. Install the male Molex connectors. Push the connectors flush with the component side of the board and solder. Do not attempt to trim or bend leads. Be sure to orient the connectors so that the connecting leads point away from the circuit board.

8. Use a pair of pliers to break off the cast metal tab on the mounting surface of each of the potentiometers R1 through R5.

Using 3/8" nuts, loosely fasten resistors R1 through R5 to the front panel in the proper order. Orient the circuit board so that the order of pot values corresponds with that on the front panel and push the leads of the pots through the holes provided for them. Turn the assembly so the foil side of the board faces up. Place support under the back edge of the board so that the circuit board is held perpendicular to the front panel. Before soldering each pot, make sure that it is seated on the circuit board. The 3/8" nuts may be tightened to hold the pot securely while it is being soldered. You will have difficulty installing the circuit boards in the front panel later if you fail to seat the pots properly, perpendicular to the circuit board. Remove the boards from the front panel after this step has been completed.

9. Install transistor Q1 and diodes D1 and D2. Note that glass encapsulated diodes are fragile. Bend the leads by grabbing the diode lead near the body of the diode with a pair of needle nose pliers. Push the diode lead against the pliers on the side of the pliers opposite the body. The flat on Q1 should match the flat shown on the printed side of the board. Solder all connections.

10. Install the level indicator light emitting diodes, LED1 on both circuit boards. Twist together two 3½" long pieces of insulated small gauge solid wire and connect the LED to points A and B on the circuit board. Check to see that polarity is correct. The flat side of the LED is the cathode. Connect the cathode to point B and the anode to point A on the AS-A1 boards.

11. Put the boards aside temporarily. Using the chassis diagram and wiring table, install transformer T1 and fuseholder F1 on the back panel. Install the line cord and the strain relief using a pair of pliers to crimp the strain relief 3" from the end of the line cord while pushing it into the chassis. Use 4 - 40 screws, nuts and lockwashers to mount the power transformer, T1.

12. Press the 4 nylon standoffs in the holes in the back panel provided for them. The standoffs face into the chassis to hold the power supply board.

13. Mount switches S1 and S2 using ¼" long, 4–40 screws, nuts and lock washers.

14. Install RCA jacks J1 through J10 on the back panel. See figure 2 for the order of washer and lug placement. Tighten the retainer nuts firmly but not tight enough to shear the nylon flat washers. The fiber washer and nylon flat washer electrically isolate the RCA jacks from the chassis. This is intentional and we do not recommend any alteration of this feature.

Power Supply Assembly and Testing

15. Using the power supply parts list and the printing on the component side of the AS-B1 board, locate and install all components on the board. Before soldering, double check diode and capacitor polarity and the orientation of voltage regulators Q1, Q2, and Q3. The flat face of each of the three terminal voltage regulators must match the flat shown on the printed side of the circuit board. Bend the leads of the voltage regulators carefully and avoid putting strain on the leads. The 3 voltage regulators should not touch one another. Bend the regulators away from each other after they have been soldered in.

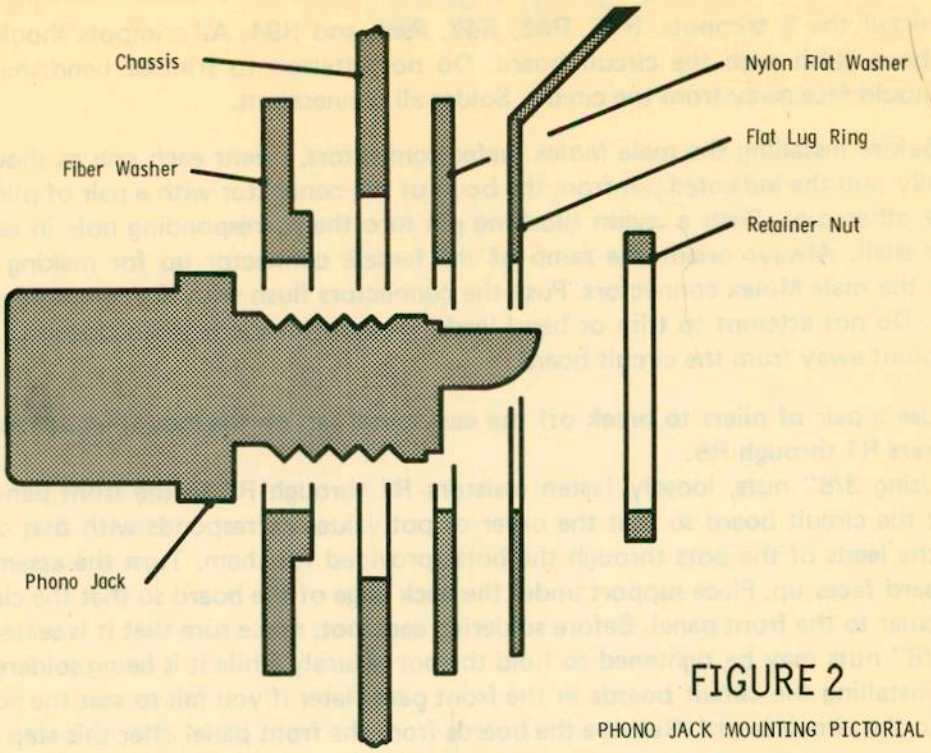

FIGURE 2

PHONO JACK MOUNTING PICTORIAL

16. Using the wiring table, wiring pictorial, and figure 3, complete the wiring of the power supply and power supply connectors. Use the small gauge stranded wire (if supplied with the kit) for making the connections to the power supply connectors.

Notice that the contacts that load into the female connector shells have a pair of long tabs and a pair of short tabs. Carefully strip 1/8" of insulation off of each wire from the power supply board. Place the wire end in the contact so that the long tabs will fold over the insulation and the short tabs will fold over the conductor. Use needle nose pliers to fold the contact tabs over the wire end. Being careful not to get solder or resin on the wiring part of the contact, solder the crimped wire to the contact. Use as little solder as possible. Carefully push the assembled contacts into their proper slots in the female connector shells. The contact should be pushed in far enough and no further than to allow the locking barb on the contact to clear the hole provided for it in the female connector shell. Be very careful to install the prepared contact in the proper slot **the first time.** It can be quite difficult to remove and re-install an improperly located contact.

17. Snap the completed power supply board on the nylon standoffs. The AC-input side of the board should be adjacent to the power transformer. Install a 1/4 amp fuse in the fuse holder F1. Plug the line cord in and turn the supply on. Using a voltmeter, measure each of the power supply voltages relative to ground on the contacts of each power supply connector. All supply voltages should be within 10% of 12 volts. Make sure the positive voltages are positive and the negative voltages are negative with respect to ground. If the power supply does not work and/or blows the fuse, you have probably installed the regulators improperly and/or made a wiring error. The LED pilot light should glow when the supply is turned on. Do not proceed with the final assembly until the power supply is working properly.

18. NOTE: READ THE FOLLOWING BEFORE REMOVING INTEGRATED CIRCUITS FROM THE CONDUCTIVE FOAM.

MOS devices are susceptible to damage by relatively low DC voltages applied across the leads of the device. It is easy to acquire a potential difference of many hundreds of volts between your body

and ground by walking on dry carpet in tennis shoes. The same sort of potential differences may be present on your workbench.

Although it is not necessary to ground yourself, your tools, and the components to an Earth ground, it is necessary to bring yourself, your tools and the components to the **same** potential before handling and installing the MOS devices. Your skin is a conductor and can be used to equalize potentials between everything involved.

Remove integrated circuits 12 through 16 **ONE AT A TIME** from the foam. Handle the foam with both hands as you remove the IC. Hold the IC between thumb and forefinger touching all the pins. With the other hand, touch the printed circuit foil pattern where the IC is to be installed. Press the IC into place, simultaneously making a double check of correct position and orientation. The semicircular notch or dot on the end of the IC package must match with the outlines printed on the circuit board. Never cut or bend leads of the IC packages. While still holding the component in the board, handle your solder and soldering iron with the other hand. Several seconds of handling is long enough in humid climates. Handle the parts and tools longer if you work in a dry climate. Even with the devices in the circuit, it is still possible to damage them with stray voltage. Avoid touching the conductors or devices in the circuit any more than necessary. Use this procedure for installing each MOS device. Press the IC's firmly onto the board before soldering. Most soldering irons with 3 wire line cords have grounded tips. If you do not use a soldering iron with a grounded tip, you should assure yourself that the iron you use does not carry an AC or DC voltage on the tip. When you feel confident that you have done everything possible to avoid damaging the integrated circuit with stray high voltage, solder all connections and repeat the procedure for each of the MOS devices.

19. Both boards should now be checked for correct component location and orientation. Check to make sure that all connections have been soldered and that there are no solder bridges or cold solder joints.

20. Using the wiring table, wiring pictorial and figure 3, complete the connections between RCA jacks J1 through J10, switch S2 and the female input-output printed circuit connectors. Again, reference to the female connector shells should always be made with the ramp up. Refer to the instructions for assembling the power supply connectors and repeat the procedure for the input-output connectors. Use the small gauge wire for making connections between J1 through J10, S2 and the female connectors. Again, carefully solder the wires to the contacts avoiding any degradation of the wiping surface.

21. Press the tinnerman nuts over the edges of the front and rear panels. Check to see that the tinnerman nuts are well seated.

22. Peel the rubber feet from the protective backing. Press them firmly to the bottom cover near each of the corners approximately an inch from the adjacent edges of the cover.

Final Assembly and Adjustments

The boards are now ready to install and check out. **On one of the boards put** a 3/8" lock washer on the bushings of R1, R2, R3 and R4. Put a 3/8" solder lug on the delay time control, R5. Use stranded wire to connect the lug to the ground bus used by the RCA jacks on the back panel. Orient the front trim panel over the front of the chassis so that the holes match. Snap the three plastic LED clips into place from the outside of the chassis. These will hold the trim panel to the front of the chassis. Mount the board to the front panel using a 3/8" flat washer and nut on each pot bushing. Turn the shafts of potentiometers R1, R2, R3 and R4 fully counter clockwise. Turn the shaft of potentiometer R5 fully clockwise. **Do not put the knobs on the shafts until both boards have been tested.** With power off, plug one of the power supply connectors on to the lower board. Always orient the ramp of the female connectors so that they face up when connected. Turn all mode mix trimpots R51, R52 and R53 and reverb trimpot R50 fully counter clockwise. Turn the bias trimpot, R94, to the center position. Plug the unit in and turn the power on. The level indicator LED should flash momentarily when power is applied. If the pilot lamp does not stay on turn the unit off, unplug the line cord, remove the circuit board, and recheck all component locations. Check again for wiring errors, solder bridges, cold solder joints and breaks in the printed circuit foil.

If the pilot lamp stays on when the unit is turned on, proceed with the testing and adjustment. After the unit has run for several minutes, lightly touch each of the voltage regulators on the power supply board. They should feel warm to the touch. If any regulator is too hot to touch, something in the circuit is drawing too much current, and the board should be removed and rechecked for solder bridges and improper connections.

The bias for the inputs of the delay devices may be set in the following way. With respect to ground, measure the power supply voltage used for the clocks and delay devices as accurately as possible. This is pin 4 on the power supply connector. Turn the bias control trimpot, R94, until 32% of the power supply voltage appears across jumper J20 and ground. It is possible to improve slightly the bias setting that was obtained above, if you have an oscilloscope and function generator, as follows. With power off, plug the lower input-output connector on the circuit board. Rotate the delay time control, R5, to the midpoint of its swing. Turn the power on. Set your function generator to ouput a 1V peak to peak sine wave at about 1KHz. Connect this signal to the rear panel input jack. Adjust the input level control R1 until the level indicator LED flashes and then reduce the setting slightly. Now look at the signal at the junction of R60 and C41. Don't despair at the quality of the signal at this point. Remember that it gets heavily filtered before getting to the output. Rotate the bias trimpot, R94, to center the signal in the region between clipping.

If everything works to this point, turn the unit off and unplug both connectors from the lower circuit. Put a locking ring over the level indicator LED. Snap the LED into the lower clip mount and press the lock ring over the back of the clip to hold the LED in place.

Mount the other circuit board in the upper set of five holes. Use washers as before on the inside and outside of the chassis on the pot bushings. Make two 1½" spacers out of the 1" and ½" plastic spacers. Put the spacers between the boards at the holes near the rear edge of both boards. Fasten the boards together temporarily with the long 6-32 screws and nuts.

Repeat the checkout and adjustment procedure described above. Connect only one set of power supply and input-output connectors for testing the upper board. If the board checks out properly, turn the unit off. Plug in the connectors for both channels. Turn the unit on and feel the voltage regulators after a few minutes of operation. They should now feel quite warm to the touch and perhaps too hot to touch for a long period of time.

Turn the unit off. Unplug the power cord. Remove the upper board from the front panel. Fasten the completed rear panel to the lower chassis cover with 3, 6-32, 3/8" long screws. To make the circuit board mounts, push the long 6-32 screws through the holes in the lower cover. Put 3, #6 fiber (flat) washers on each screw and thread 6-32 nuts down tightly on each stack of washers. The lower circuit board should still be mounted to the front panel. Put a lock ring over the lower level indicator LED cable. Push the LED into its clip mount and press the lock ring over the clip mount to hold the LED in place. Lower the front panel with lower circuit board over the long 6-32 screws. Put the 1" and ½" long spacers on top of the lower board over the long screws to make two 1½" long spacers to support the upper circuit board. Fasten the front panel to the lower chassis cover using 3, 6-32 3/8" long screws. Now mount the upper board. Don't forget the 3/8" lock washers on each pot bushing on the inside of the chassis, and the 3/8" flat washers on the outside. Use 6-32 nuts and #6 lock washers to fasten the upper board to the rear chassis mounts. Mount the two remaining LEDs as before. Install all the power and signal connectors. Fasten the top chassis cover to the completed lower chassis with 4, 6-32 3/8" screws. Press the knobs on the shafts of the pots so that the indicator line on the knob swings from min to max or low to high as the pot is rotated. Wipe a very small amount of vaseline on the pot shafts before pressing the knobs on. The lubricant makes it easier to remove the knobs for service of the circuit boards.

If problems arise during checkout that cannot be traced to improper component placement or orientation, cold solder joints, solder bridges, wiring errors, etc., please call or write our repair staff for recommendations. Note: The serial analog delay devices are expensive. If you suspect that one of them has failed, it is strongly recommended that you not remove it from the circuit unless you are certain of your diagnosis. Removal of a good integrated circuit from the circuit greatly enhances the possiblity of damaging it with stray high voltage.

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(✓) 19. Both boards should now be checked for correct component location and orientation. Check to make sure that all connections have been soldered and that there are no solder bridges or cold solder joints.

(✓) 20. Using the wiring table, wiring pictorial and figure 3, complete the connections between RCA jacks J1 through J10, switch S2 and the female input-output printed circuit connectors. Again, reference to the female connector shells should always be made with the ramp up. Refer to the instructions for assembling the power supply connectors and repeat the procedure for the input-output connectors. Use the small gauge wire for making connections between J1 through J10, S2 and the female connectors. Again, carefully solder the wires to the contacts avoiding any degradation of the wiping surface.

(✓) 21. Press the tinnerman nuts over the edges of the front and rear panels. Check to see that the tinnerman nuts are well seated.

(✓) 22. Peel the rubber feet from the protective backing. Press them firmly to the bottom cover near each of the corners approximately an inch from the adjacent edges of the cover.

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Repair Service

If you have a problem that you cannot solve, the kit may be returned for factory service. Please return the entire unit and remove all modifications and additions.

A confirmation sheet will be sent upon receipt of the kit. Please do not ask for an estimate or a detailed report on exactly what was done in repairing your unit, we cannot provide this service.

SHIPPING INSTRUCTIONS

* Pack in a large carton with at least 3 inches of padding on all sides. Do not attempt to return the kit in the original box.
* Include all relevant correspondence and a brief description of the difficulty.
* Ship **prepaid** by UPS or insured Parcel Post. We cannot pick up repairs sent by bus.
* Ship to:

Southwest Technical Products Corp.
Repair Department
219 W. Rhapsody
San Antonio, Texas 78216

How It Works

The schematic and block diagram of the 2AS/A have been included in the instruction set. The analog input signal is first mixed with the delayed output of both channels providing control of recirculation and cross mixing. The overall gain of the mixer stage is controlled by varying resistor R1 in the feedback loop of IC1. The signal is then filtered and compressed. The input low pass filter is needed to limit the bandwidth of the signal before it is sampled and passed through the delay devices in discrete time. The compressor increases the level of low amplitude signals and decreases the level of high amplitude signals, i.e., it compresses the signal. This allows a wider dynamic range of signals to be passed through the delay devices. The level indicator circuit rectifies and amplifies the signal and compares it with the voltage drop across a silicon diode. The comparator changes state and drives an LED indicator through a buffer when positive or negative peaks at the inputs of the delay devices exceed approximately 0.6 V.

A low pass passive filter precedes each delay device to prevent op-amp noise from being folded back or aliased down into the audio band and showing up as intermodulation distortion.

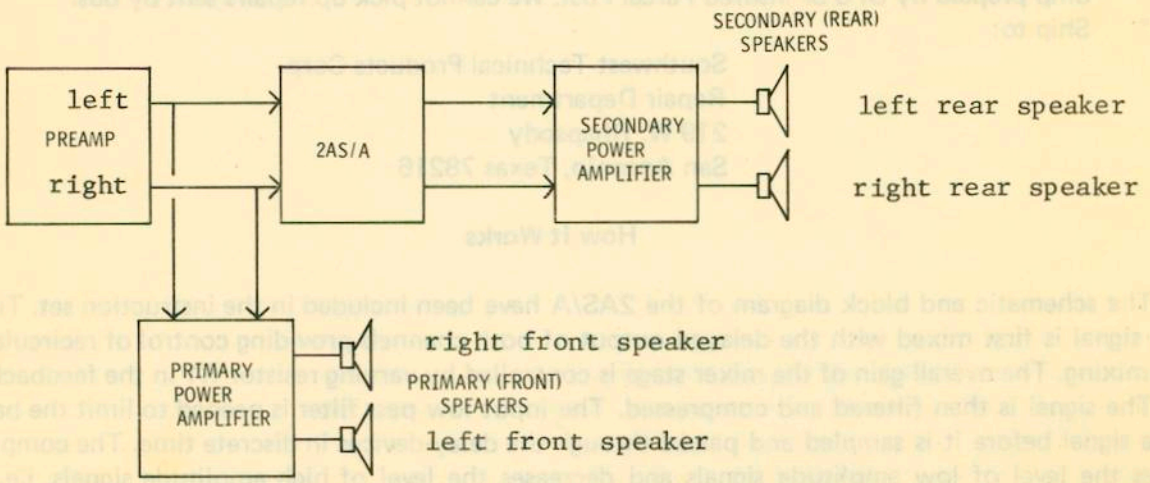
The signal is sampled and clocked through the delay devices at a frequency determined by the voltage applied to the input of the VCO. The 2 phase clock required by the delay devices is derived from a pair of inverters that follow the VCO. The outputs of the last 3 stages of the delay chain are mixed and filtered. The 9 pole low pass filter smooths the signal out of discrete time and attenuates clock residue. After being expanded (the opposite of compression) to restore levels, the signal is mixed with the input to provide conventional reverb or other effects with external voltage control. A final stage with adjustable gain follows the expandor to provide the delayed output used in ambience synthesis.

Use and Applications of the 2AS/A

Most of us find stereo recordings pleasant to listen to although lacking in depth and spaciousness. Those who have invested in 4-channel **reproducing** equipment have done so (we think) in hope of hearing something closer to the "real thing". Many who have listened to 4-channel systems have been sorely disappointed in their performance, not to mention the lack of standardization and paucity of encoded recordings. In response to these reactions and our own misgivings about the state of the art of "quadraphonics", we have developed the 2AS/A which we believe offers some substantial advantages over conventional 2 and 4 channel systems.

The 2AS/A does not increase the accuracy of reproduced sounds in any way. It does however, in most applications, and with many kinds of music, enhance the feeling of realism without degrading the information content of the signal that is first perceived. The 2AS/A allows the user to introduce delayed and limited bandwidth signals from the rear and sides of the listening room in much the same way that a concert hall or auditorium does in producing multiple reflections of the direct and reflected sound from the walls and ceiling.

It is recommended that you use a modest power amplifier-speaker combination for the secondary channels since the usable bandwidth of the 2AS/A is not much greater than 5 KHz, and because the level of the rear channels is usually kept well below that of the front speakers. Locate the secondary speakers in the upper rear sides of the listening room. They should not be directed at the listening area but rather towards each other or towards the walls or ceiling. The typical ambience system will require 4 power amplifier channels and 4 speakers as shown below.



The 2AS/A will accept a wide range of input levels. You may take the signal from the most convenient output of your preamp or tape machine. The inputs of the 2AS/A are paralleled with another pair of jacks. If you have to break the signal flow to the primary power amp to get signals into the 2AS/A you can patch the break with one extra pair of cables from the input jacks of the 2AS/A.

Before turning the 2AS/A on, turn the input level, recirculate, cross mix, and output level controls fully counterclockwise, and turn the delay time control fully clockwise.

Use the signal at the OUT jacks for the secondary speakers. The REVERB OUT signal is used for other purposes. Note: the 2AS/A **will oscillate** and can damage the components in your system. Use caution in making the first adjustments of delay and input levels. Oscillation may always be stopped by rotating the input level controls to the low position. With the output level in the low position, increase both input levels until the level indicator LEDs begin to flicker, then reduce the setting slightly so that there is no flicker. Rotate the 6/6 mode mix trimpot R48 fully clockwise and leave the others in the fully counter-clockwise positions. Increase the output level so that you can clearly hear the delayed signal. Now rotate the delay control slowly counter-clockwise. You should notice that near maximum delay you can hear a high frequency tone and considerable distortion. In this region of the setting near maximum delay, you are violating the sampling theorem* and the unit is failing to reject the clocking signals. For ambience synthesis, the 2AS/A is used with delays much shorter than the maximum that is available.

Gradually increase the settings of the recirculate and cross mix controls. You will have to reduce the input level slightly as you do so. Try mixing in greater proportions of the shorter delays by using a screwdriver to rotate the 4/6 (R51, and 5/6 (R52) mode mix trimpots clockwise.

With the other controls at fixed settings: Increasing the cross mix of either channel increases the incoherence (dissimilarity between one of the primary channels and the corresponding secondary channel) and reverberation time. It is generally desirable to have little or no coherence between the front and rear

channels. Increasing the delay time increases the reverberation time. Increasing the mode mix settings increases the dispersion or number of resonant modes in the response and increases the buildup of echo density. Real rooms have a large number of resonant modes, many more in fact than the 2AS/A or any other ambience synthesizer can produce.

By now it should be apparent that there are many possible settings of the controls—not all of which however produce pleasing results. Your own judgement should be used to determine the best settings for your situation. Experiment with speaker placement and loudness levels between front and rear.

The most pleasing and realistic results seem to be obtained with the secondary speakers located in the upper rear part of the listening room and directed at each other or slightly towards the rear walls. The level of the delayed signal must be kept well below that of the primary signal otherwise you will degrade the direction and image information that is in the stereo signal.

For best noise performance of the unit, it should be operated with the largest possible input signal consistent with the input requirements of the delay devices. A flicker or continuous glow of the level indicator LEDs means that signal peaks at the inputs of the delay devices are clipping or near clipping. The input level should be decreased until no flicker or glow is observed.

You may wish to calibrate the delay time control The delay time, t_d, is related to the clock frequency, f_c, by $t_d = \frac{N}{2f_c}$, where N is the total number of stages of delay. In the 2AS/A, N is 3*1024=3072 stages per channel. The clock frequency at various positions of the delay time control may be measured with a counter or scope at pin 4 of IC12 or at any of the inputs or outputs of IC13.

* *According to the Nyquist Sampling Theorem, it is possible to reconstruct waveforms from samples taken at twice the highest frequency to be reproduced. It is good practice to sample at several times the highest frequency to be reproduced.*

Music Applications of the 2AS/A

Musicians have known for many years that there are a myriad of uses for audio delay. Reverberation, echo, chorus, flanging, vibrato, pitch change, and many other effects can be produced with delay devices. In the past, the production of these effects has required a lot of bulky, expensive, complex electromechanical equipment and has been way out of reach of the low budget musician. Digital delay technology has overcome many of the limitations of the electromechanical equipment and has made effects possible that cannot be achieved in other ways. But, the price of a versatile digital delay unit is still out of reach of most musicians. The recent developement of serial analog delay devices has made it possible to offer a versatile audio delay unit at a reasonable cost.

Reverberation

A reverb output and reverb control have been incorporated into each channel of the 2AS/A. Most of the musical delay effects depend on a certain amount of the delayed signal being mixed with the input signal. The extent of direct-delayed mix can be varied by turning the REVERB trimpot. Access to the REVERB trimpots of both channels is available through the holes in the top and bottom covers. Clockwise rotation of the REVERB trimpot increases the amount of delayed signal mixed with the input signal.

High level audio signals such as the outputs of guitar and microphone preamps or synthesizer outputs may be connected to the input terminals of the 2AS/A. Note: The 2 input terminals per channel are not mixing inputs—each channel will accept only one input. The use of RCA connectors instead of 1/4" phone plugs was design concession to the Hi-Fi user.

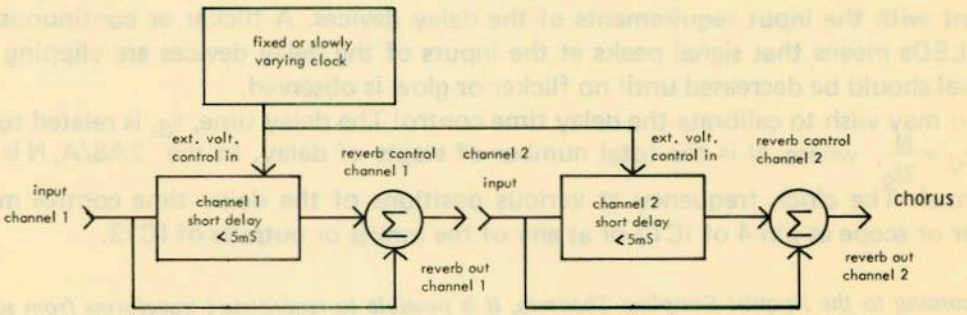
You will find that you have a tremendous amount of control over the quality of the reverb sound from the 2AS/A. It is important to experiment with various settings of delay time, recirculate, mode mix, and cross mix (if both channels are used). Beware of setting up conditions at or near oscillation. Again, avoid overdriving the inputs of the unit. You may find it helpful to make up "patch" sheets showing the positions of the various control for desirable effects. The reverb output level is not variable. It is recom-

mended that you set the gain of your power amplifier at a low level while making adjustments to the 2AS/A. This will help prevent damage to your system if the unit begins to oscillate.

Chorus Effects

Chorus effects (making one voice or instrument sound like several) may be produced with the 2AS/A used as shown below.

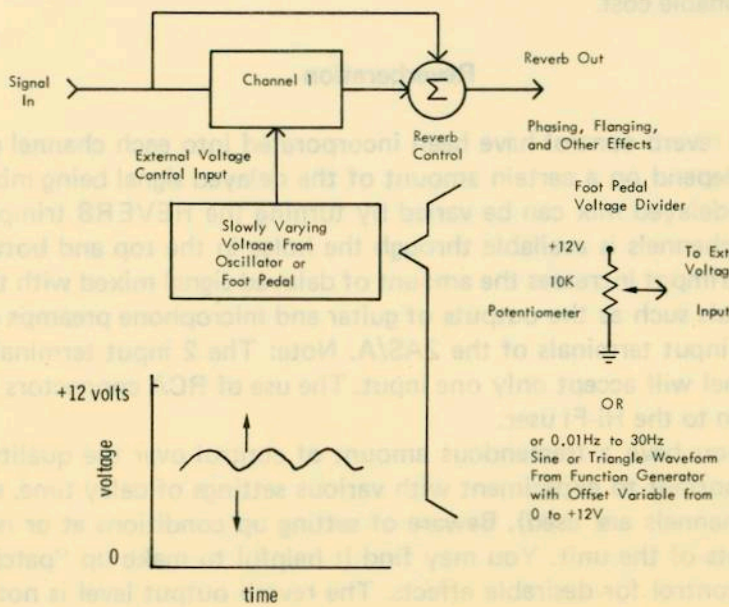
If the clock frequency is varied slowly over a small range, the effect is enhanced due to the more random separation of voices. This can be done with external voltage control as discussed below.


fixed or slowly varying clock
ext. volt. control in
reverb control channel 1
channel 2 input
ext. volt. control in
reverb control channel 2
input channel 1
channel 1 short delay < 5mS
channel 2 short delay < 5mS
chorus
reverb out channel 1
reverb out channel 2

Flanging-Phasing

For these and other effects, an external low frequency oscillator is needed.

A simple voltage divider and a 12-volt power supply mounted in a foot pedal control can also be used for external voltage control of the VCOs in the 2AS/A. The foot pedal control makes possible very "expressive" flanging and other effects under direct control of the musician. The VCO inputs of the 2AS/A require a voltage between 0 and +12 volts. If you use a low frequency oscillator, you must have the capability of giving the output a positive offset in this range. The flanging–phasing application is shown below.



mended that you set the gain of your power amplifier at a low level while making adjustments to the 2AS/A. This will help prevent damage to your system if the unit begins to oscillate.

Chorus Effects

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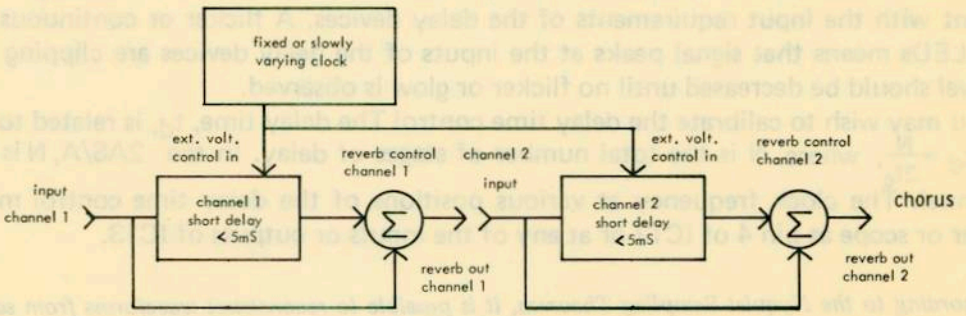
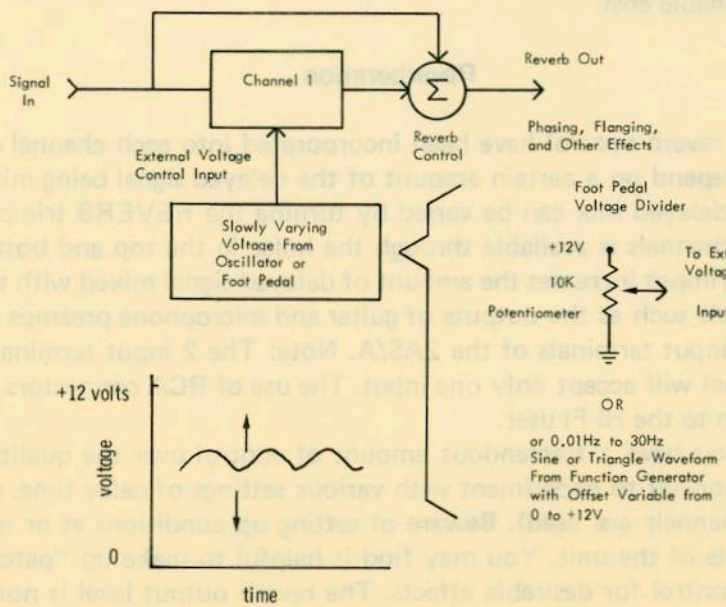

fixed or slowly varying clock
ext. volt. control in
reverb control channel 1
channel 2 input
ext. volt. control in
reverb control channel 2
input channel 1
channel 1 short delay < 5mS
channel 2 short delay < 5mS
chorus
reverb out channel 1
reverb out channel 2

Flanging-Phasing

For these and other effects, an external low frequency oscillator is needed.

A simple voltage divider and a 12-volt power supply mounted in a foot pedal control can also be used for external voltage control of the VCOs in the 2AS/A. The foot pedal control makes possible very "expressive" flanging and other effects under direct control of the musician. The VCO inputs of the 2AS/A require a voltage between 0 and +12 volts. If you use a low frequency oscillator, you must have the capability of giving the output a positive offset in this range. The flanging–phasing application is shown below.

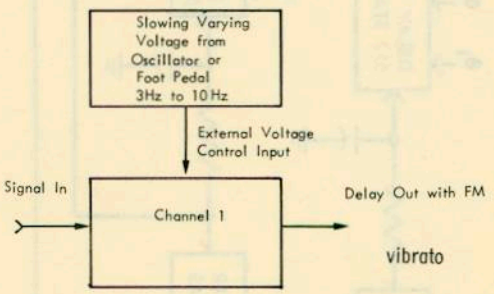


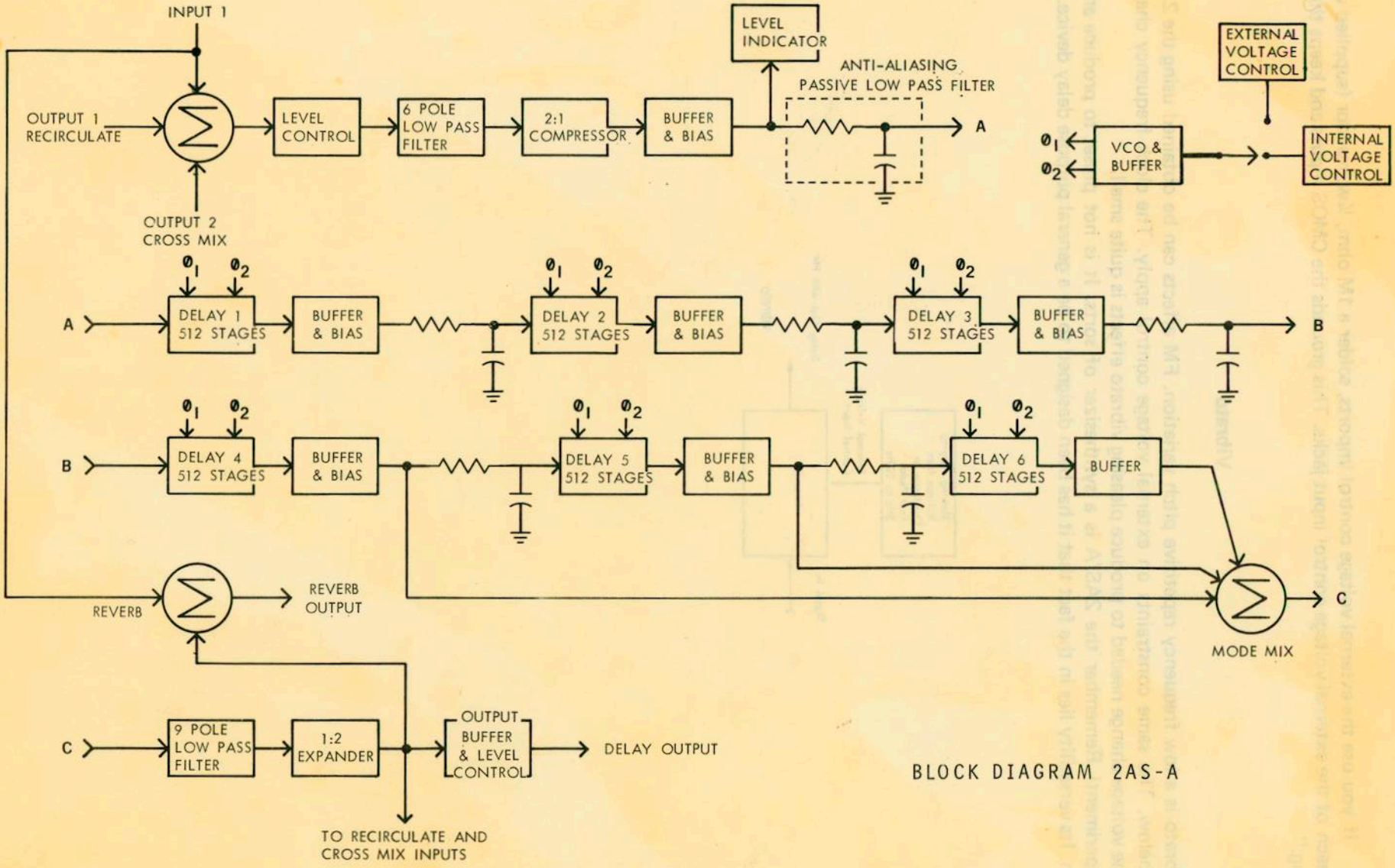
NOTE: If you use the external voltage control imports, solder a 1M ohm, ¼w, resistor (supplied with kit) across each of the external voltage control input jacks. This grounds the CMOS inputs and keeps them from "floating."

Vibrato

Vibrato is a low frequency repetitive pitch variation. FM effects can be obtained using the 2AS/A as shown below. The same constraints on external voltage control apply. The clock frequency change and hence the voltage change needed to produce pleasing vibrato effects is quite small.

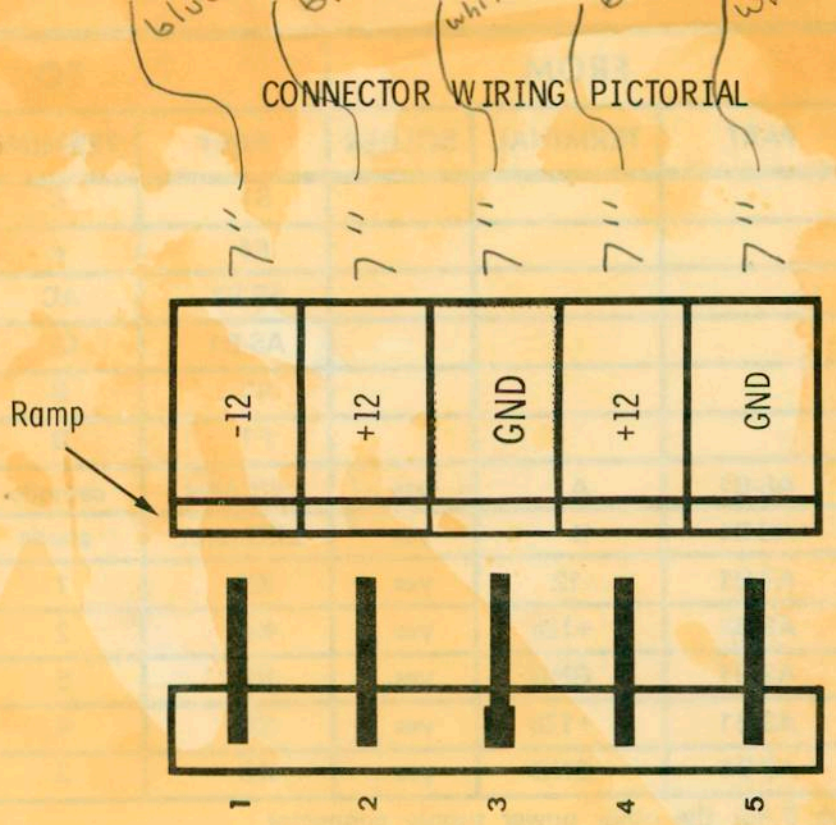
Experiment! Remember the 2AS/A is a synthesizer of sorts. It is not preset to produce any given function. Its versatility lies in the fact that it has been designed to be a general purpose delay device.


Slowing Varying Voltage from Oscillator or Foot Pedal 3Hz to 10Hz
External Voltage Control Input
Signal In
Channel 1
Delay Out with FM
vibrato

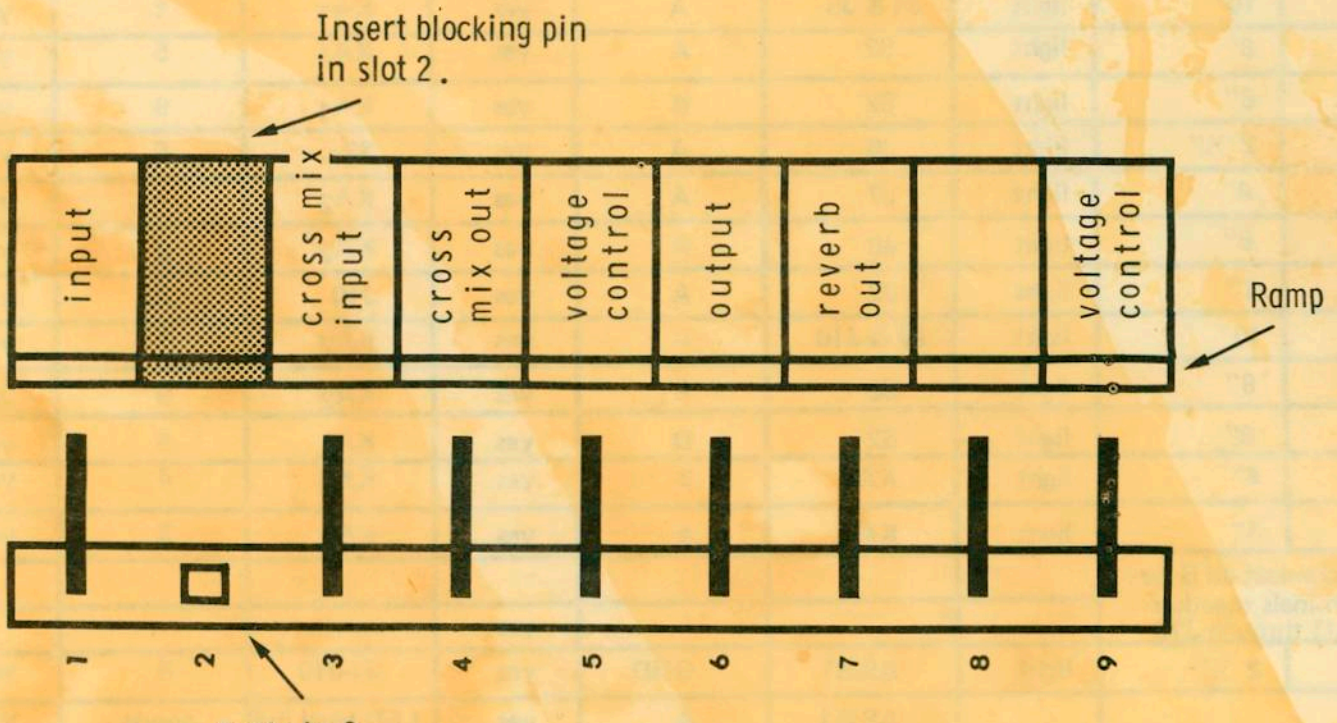


BLOCK DIAGRAM 2AS-A

CONNECTOR WIRING PICTORIAL



Connector ~~KB~~ "KA"



Connector ~~KA~~ "KB"

FIGURE 3

WIRE			FROM			TO		
STEP	LENGTH	GAUGE	PART	TERMINAL	SOLDER	PART	TERMINAL	SOLDER
1. primary T1 2 leads						S1	C	yes ✓
						F1	A	yes ✓
2. secondary T1 3 leads						AS-B1	AC	yes ✓
						AS-B1	CT	yes ✓
3. line cord 2 leads both leads 3" long						S1	B	yes ✓
						F1	B	yes ✓
4. 13" twisted pair			AS-B1	A	yes ✓	LED pilot	cathode	yes ✓
			AS-B1	B	yes ✓	LED pilot	anode	yes ✓
5.	7"	light	AS-B1	-12	yes ✓	KB	1	yes ✓
6.	7"	light	AS-B1	+12a	yes ✓	KB	2	yes ✓
7.	7"	light	AS-B1	GND	yes ✓	KB	5	yes ✓
8.	7"	light	AS-B1	+12b	yes ✓	KB	4	yes ✓
9.	7"	light	AS-B1	GND	yes ✓	KB	3	yes ✓
10.	repeat steps 5 through 9 for the other power supply connector							
11.	2½"	light	J1	A	yes ✓	S2	C	yes ✓
12.	8"	light	J2	A	yes	KA_1	7	yes
13.	8"	light	J3	A	yes	KA_1	6	yes
14.	1"	light	J4	A	yes	J5	A	yes
15.	10"	light	J4 & J5	A	yes	KA_1	1	yes
16.	8"	light	S2	A	yes	KA_1	5	yes
17.	8"	light	S2	B	yes	KA_1	9	yes
18.	2 ½"	light	J6	A	yes ✓	S2	F	yes ✓
19.	8"	light	J7	A	yes	KA_2	7	yes
20.	8"	light	J8	A	yes	KA_2	6	yes
21.	1"	light	J9	A	yes	J10	A	yes
22.	10"	light	J9 & J10	A	yes	KA_2	1	yes
23.	8"	light	S2	E	yes	KA_2	9	yes
24.	8"	light	S2	D	yes	KA_2	5	yes
25.	4"	light	KA_1	3	yes	KA_2	4	yes
26.	4"	light	KA_1	4	yes	KA_2	3	yes
27. connect all B terminals together J1 through J10								
					yes			
28.	2 ½"	light	AS-B1	GND	yes	J1-J10	B	yes
29. 3½" twisted pair			AS-A1	A	yes ✓	LED level ind	anode	yes ✓
			AS-A1	B	yes ✓	" " "	cathode	yes ✓
30.	repeat step 26 for the other AS-A1 board							
31.	11"	light	connect 3/8" lug to input output ground buss		solder connections			

IN4 soldered board 1-2

Resistors

R1	50K	ohm linear taper potentiometer	
R2	10K	" " " "	
R3	10K	" " " "	
R4	50K	" " " "	
R5	50K	" " " "	
R6	10K	ohm ¼ watt 5% carbon film resistor	
R7	~~15K~~ = 27K	" " " " " "	
R8	100	" " " " " " "	
R9	~~22K~~ = 47K	" " " " " " "	
R10	~~22K~~ = 47K	" " " " " " "	
R11	10K	" " " " " " "	
R12	10K	" " " " " " "	
R13	10K	" " " " " " "	
R14	10K	" " " " " " "	
R15	10K	" " " " " " "	
R16	10K	" " " " " " "	
R17	10K	" " " " " " "	
R18	10K	" " " " " " "	
R19	10K	" " " " " " "	
R20	100K	" " " " " " "	
R21	12K	" " " " " " "	
R22	1K	" " " " " " "	
R23	10K 1%	½ watt carbon film resistor	
R24	10K 1%	½ watt carbon film resistor	
R25	2.2K	ohm ¼ watt 5% carbon film resistor	
R26	100K	" " " " " " "	
R27	10K	" " " " " " "	
R28	6.8	" " " " " " "	
~~R29~~		~~Sorry, there is no R29~~	
R30	22K	ohm ¼ watt 5% carbon film resistor	
R31	1K	~~220K~~ → 470K " " " "	
R32	10K	" " " " " " "	
R33	10K	" " " " " " "	
R34	10K	" " " " " " "	
R35	10K	" " " " " " "	
R36	10K	" " " " " " "	
R37	10K	" " " " " " "	
R38	10K	" " " " " " "	
R39	10K	" " " " " " "	
R40	10K	" " " " " " "	
R41	10K	" " " " " " "	
R42	100K	" " " " " " "	
R43	10K	" " " " " " "	
R44	10K	" " " " " " "	
R45	15K	" " " " " " "	
R46	47K	" " " " " " "	
R47	47K	" " " " " " "	
R48	47K	" " " " " " "	
R49	47K	" " " " " " "	
R50	10K	ohm linear trimpot X201R103B	
R51	10K	ohm linear trimpot X201R103B	
R52	10K	" " " "	
R53	10K	" " " "	
R54	6.8	ohm ¼ watt 5% carbon film resistor	
R55	100K	ohm ¼ watt 5% carbon film resistor	
R56	390K	" " " " " " "	
R57	10K	" " " " " " "	
R58	6.8	" " " " " " "	
R59	12K	" " " " " " "	
R60	10K	" " " " " " "	
R61	12K	" " " " " " "	
R62	10K	" " " " " " "	
R63	3.9K	" " " " " " "	
R64	6.8	" " " " " " "	
R65	470	" " " " " " "	
R66	470	" " " " " " "	
R67	2K	" " " " " " "	
R68	220	Jumper wire " " "	
R69	470	" " " " " " "	
R70	470	" " " " " " "	
R71	3.9K	" " " " " " "	
R72	220	Jumper wire " " "	
R73	2K	" " " " " " "	
R74	10K	" " " " " " "	
R75	12K	" " " " " " "	
R76	12K	" " " " " " "	
R77	10K	" " " " " " "	
R78	6.8	" " " " " " "	
R79	470	" " " " " " "	
R80	470	" " " " " " "	
R81	3.9K	" " " " " " "	
R82	2K	" " " " " " "	
R83	220	Jumper wire " " "	
R84	470	" " " " " " "	
R85	470	" " " " " " "	
R86	3.9K	" " " " " " "	
R87	220	Jumper wire " " "	
R88	2K	" " " " " " "	
R89	33K	" " " " " " "	
R90	33K	" " " " " " "	
R91	33K	" " " " " " "	
R92	10K	" " " " " " "	
R93	12K	" " " " " " "	
R94	10K	cermet trimpot	
R95	12K	ohm ¼ watt 5% carbon film resistor	
R96	2K	" " " " " " "	
R97	3.9K	" " " " " " "	
R98	470	" " " " " " "	
R99	470	" " " " " " "	
R100	6.8	" " " " " " "	

KF 470K

1-707-448-6489

Parts List - #2AS/A Ambience Synthesizer (Page 2 of 3 pages)

Resistors - Cont.

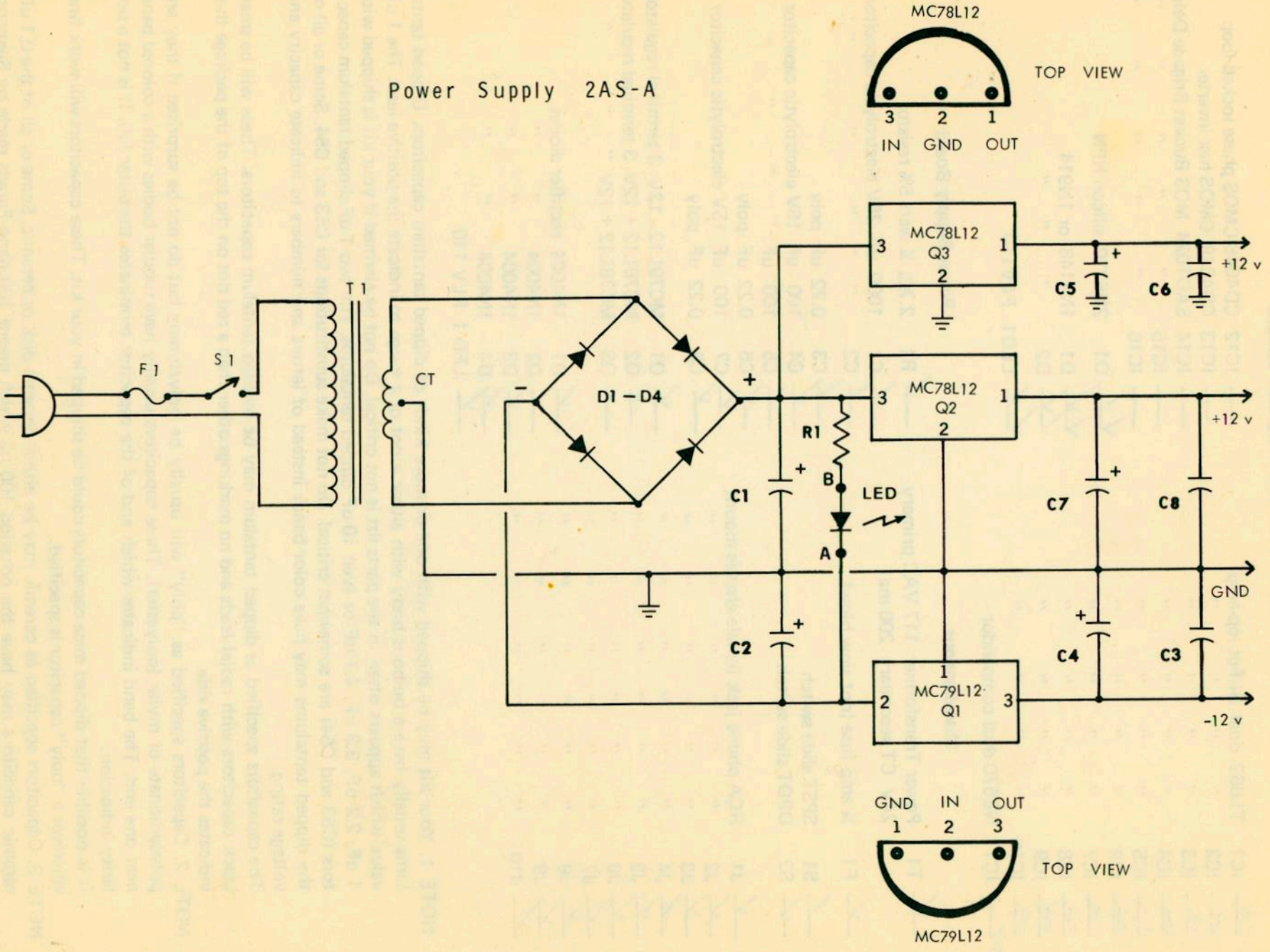
R101	220	ohm ¼ watt 5% carbon film resistor (Jumper wire)
R102	470	" " " " " " "
R103	470	" " " " " " "
R104	3.9K	" " " " " " "
R105	220	ohm ¼ watt 5% carbon film resistor (Jumper wire)
R106	2K	" " " " " " "
R107	10K	" " " " " " "
R108	1M	" " " " " " "

Capacitors

C1	1	uF dipped tantalum (see note 1)
C2	3000	pF poly (see note 2)
C3	0.1	uF ceramic
C4	8200	pF poly
C5	0.1	uF ceramic (see note 3)
C6	470	pF poly
C7	3000	pF "
C8	8200	pF "
C9	1	uF dipped tantalum
C10	0.1	uF ceramic
C11	470	pF poly
C12	0.1	uF ceramic
C13	1	uF dipped tantalum
C14	0.1	uF ceramic
C15	0.1	uF "
C16	0.1	uF "
C17	0.1	uF "
C18	0.1	uF "
C19	1	uF dipped tantalum
C20	0.1	uF ceramic
C21	500	pF poly
C22	9100	pF "
C23	3300	pF "
C24	0.1	uF ceramic
C25	1	uF dipped tantalum
C26	0.1	uF ceramic
C27	1	uF dipped tantalum
C28	820	pF poly
C29	0.1	uF ceramic
C30	0.1	uF "
C31	500	pF poly
C32	9100	pF "
C33	0.1	uF ceramic
C34	500	pF poly
C35	3300	pF poly
C36	9100	pF "
C37	3300	pF "
C38	1	uF dipped tantalum
C39	0.1	uF ceramic
C40	0.1	uF "
C41	1	uF dipped tantalum
C42	0.1	uF ceramic
C43	1	uF dipped tantalum
C44	0.1	uF ceramic
C45	2200	pF "
C46	2200	pF "
C47	1	uF dipped tantalum
NO C48	0.1	uF ceramic
C49	1	uF dipped tantalum
C50	1	uF " "
C51	1	uF " "
C52	0.1	uF ceramic
C53	1	uF dipped tantalum
C54	1	uF " "
C55	1	uF " "
C56	1	uF " "
C57	0.1	uF ceramic
C58	2200	pF "
C59	2200	pF "
C60	0.1	uF "
C61	1	uF dipped tantalum
C62	1	uF " "
C63	1	uf " "
C64	0.1	uF ceramic
C65	0.1	uF "
C66	2200	pF "
C67	4.7	uF dipped tantalum
C68	2200	pF ceramic

100NS

Power Supply 2AS-A



Semiconductors and Integrated Circuits

- OK IC1 TL082 dual Bi-Fet op-amp
- OK IC2 " " " "
- OK IC3 " " " "
- OK IC4 " " " "
- OK IC5 " " " "
- OK IC6 " " " "
- OK IC7 " " " "
- OK IC8 " " " "
- OK IC9 " " " "
- OK IC10 " " " "
- bad → X IC11 NE570 dual compandor
- IC12 CD4046 CMOS phase locked loop
- IC13 CD4049 CMOS hex inverter
- IC14 SAD1024 MOS Bucket Brigade Delay
- IC15 " " " " "
- IC16 " " " " "
- Q1 2N5210 silicon NPN
- D1 1N4148 or 1N914
- D2 " " "
- LED1 FLV110

Miscellaneous

- T1 Power Transformer 117 VAC primary 24V CT secondary 200 ma
- F1 ¼ amp fuse (not slow blow)
- S1 SPST slide switch
- S2 DPDT slide switch
- J1 RCA phone jack female chassis mount
- J2 " " " " " "
- J3 " " " " " "
- J4 " " " " " "
- J5 " " " " " "
- J6 " " " " " "
- J7 " " " " " "
- J8 " " " " " "
- J9 " " " " " "
- J10 " " " " " "

Power Supply Board

- R1 2.7KΩ ¼ watt 5% resistor
- C1 1000 uF 25V electrolytic capacitor
- C2 " " " " "
- C3 0.22 uF poly
- C4 100 uF 15V electrolytic capacitor
- C5 100 uF " " "
- C6 0.22 uF poly
- C7 100 uF 15V electrolytic capacitor
- C8 0.22 uF poly
- Q1 MC79L12 - 12V 3 terminal regulator
- Q2 MC78L12 + 12V 3 terminal regulator
- Q3 MC78L12 + 12V " " "
- D1 1N4004 rectifier diodes
- D2 1N4004 " "
- D3 1N4004 " "
- D4 1N4004 " "
- LED 1 FLV 110

NOTE 1. Your kit may be shipped with one or more kinds of dipped tantalum capacitors. Dipped tantalums usually have a bulbous body with either a dot or a + sign to indicate the positive lead. The 1 uF value which appears often in the parts list is not critical. Do not be alarmed if your kit is shipped with 1 uF, 2.2 uF, 3.3 uF, 4.7 uF or even 10 uF dipped tantalums. The two 1 uF dipped tantalum capacitors (C53 and C54) are somewhat critical. Do not make substitutions for C53 and C54. Some or all of the dipped tantalums may have color bands instead of letters and numbers to indicate capacity and voltage rating.

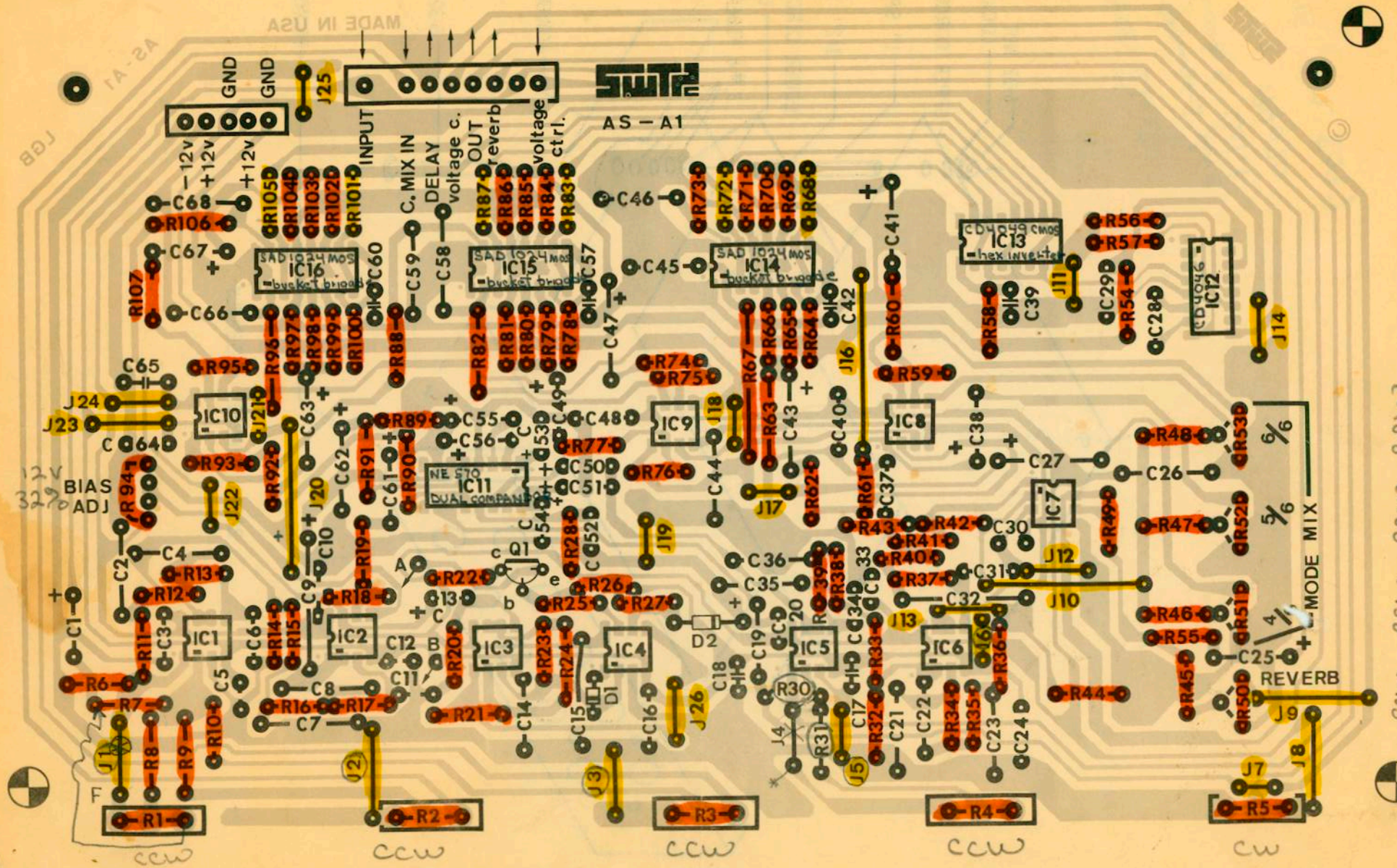
The capacitors specified as dipped tantalum may be molded tantalum capacitors. These will be small black capacitors with radial leads and no markings other than a red dot on the top of the package that indicates the positive side.

NOTE 2. Capacitors specified as "poly" will usually be polystyrene but do not be surprised if they are polycarbonate or mylar (polyester). These capacitors usually have tubular bodies with a colored band near one end. The band indicates which end of the capacitor terminates the outer foil. It is not a polarity indication.

It is possible that dipped mica capacitors could be shipped in your kit. These capacitors will work fine wherever a "poly" capacitor is specified.

NOTE 3. Capacitors specified as ceramic may be either ceramic disk or ceramic. Some or all of the 0.1 uF ceramic capacitors may have the notation 100 nS which means 100 nano-Farads made by Siemens. 100 nano-Farads is equivalent to 0.1 uF.

Distortion channel #1



IC1 for IC7 no change
IC2 for IC7 no change
IC3 for IC7 no change
IC4 for IC7 no change
IC5 " " " "
IC6 " " " "

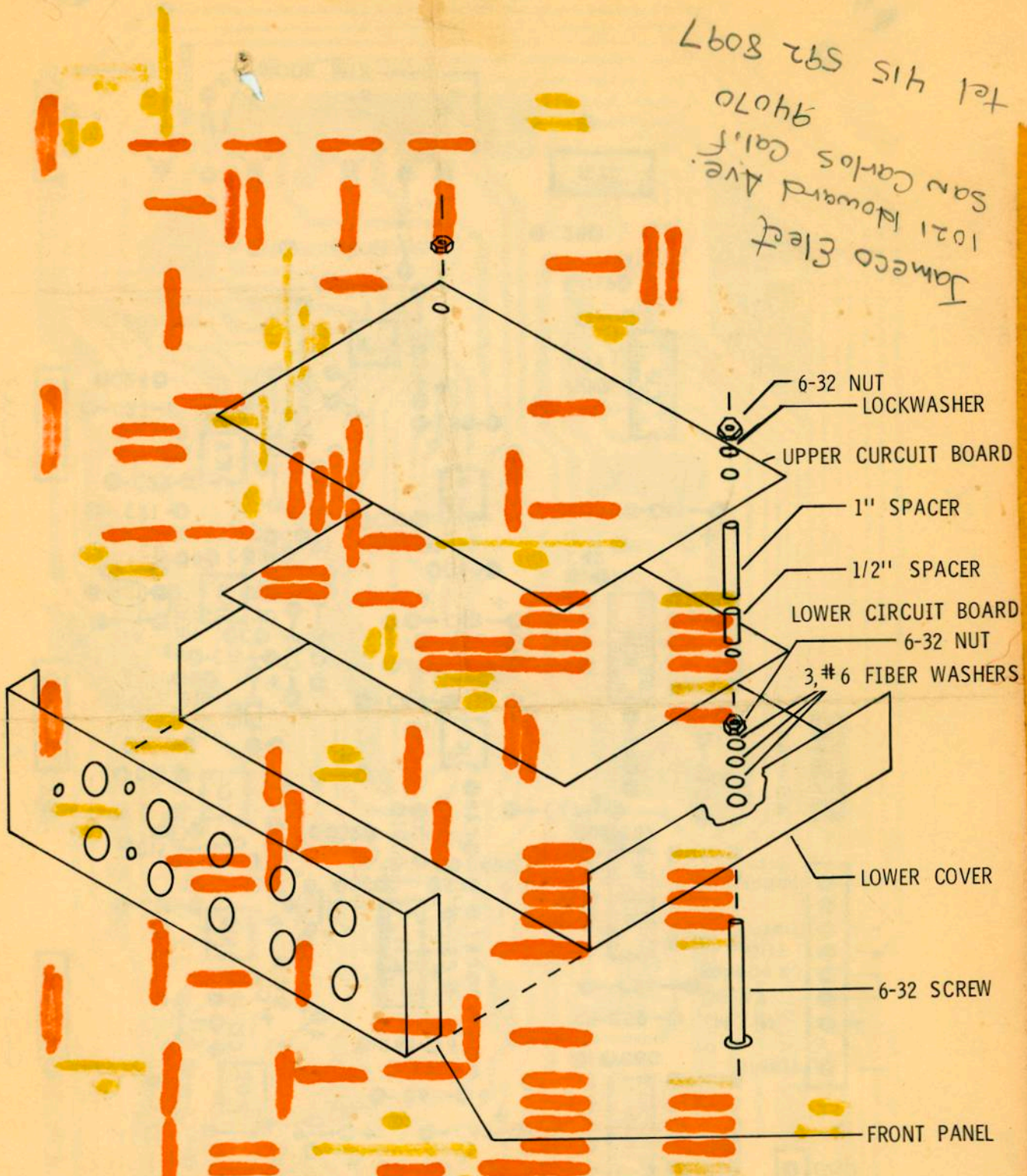
IC8 For IC7 no change
IC9 " " " "
IC10 " " " "

$4.95

NE570N 7710 S

Signetics

Dameco Elect
1021 Howard Ave.
San Carlos Cal.f
94070
Tel 415 592 8097

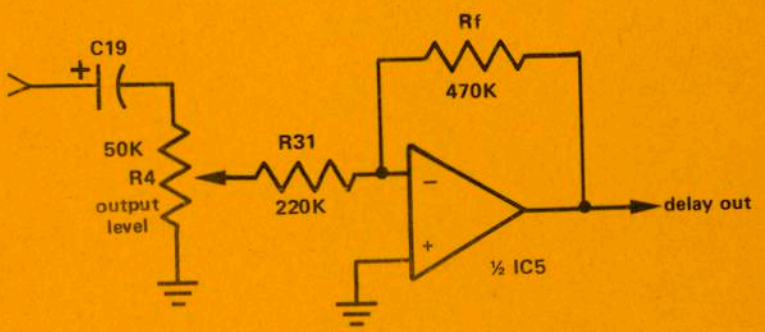


2AS/A CHASSIS ASSEMBLY

2AS/A Addendum

Please read the following carefully before beginning construction of the kit. Make corrections to your instruction set as indicated:

1. Change R1 in the power supply parts list from 2.7Ω to 2.7K Ω.
2. On page 3, step 6 of the instruction set, 4 of the 5 trim pots are mislabled. Change R45, R46, R47 and R48 to R50, R51, R52 and R53 respectively.
3. The power transformer is not a 12VCT unit as stated in the parts list. The transformer secondary when rectified and filtered provides approximately ±15V.
4. When installing resistors in the circuit boards, omit the following and replace them with solid wire jumpers: R68, R72, R83, R87, R101 and R105. Make a note on your parts list by each one of these—cross out 220 Ω and write JUMPER by each resistor value.
5. Write in the new values for the following resistors R7—27K, R9—47K and R10—47K. You may note on the first page of your instruction set that the input impedence is now approximately 27KΩ.
6. The following modification to the 2AS/A circuit is not essential, but it improves the operation of the output stage. The modification requires no foil changes. The improved output stage looks like this:



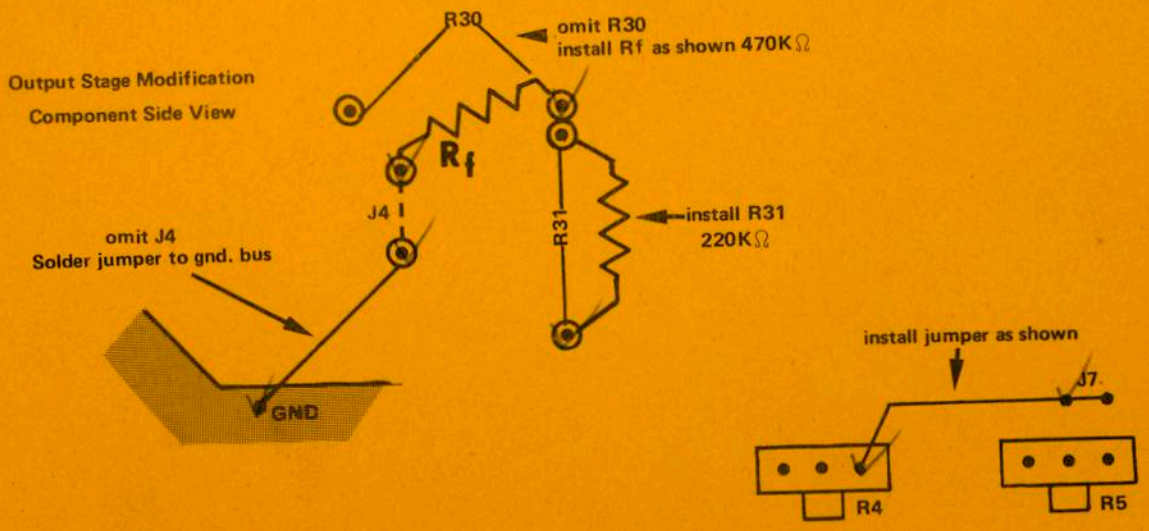
—To make this modification, do not install J4, R30 and R31.

—Solder a piece of solid wire in the J4 hole closest to the front edge of the board. Bend this wire (on the foil side) over to the adjacent ground bus and solder.

—Solder a 220KΩ resistor in the R31 position. instead of the 1K as listed.

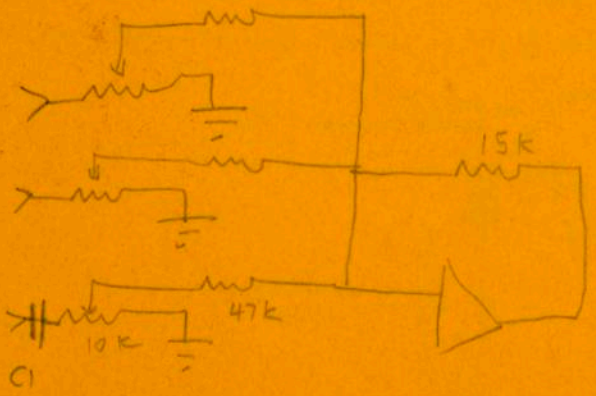
—Solder a 470KΩ feedback resistor as shown below.

—Solder a jumper wire as shown between J7 and the unused lug of R4—do not remove J7.

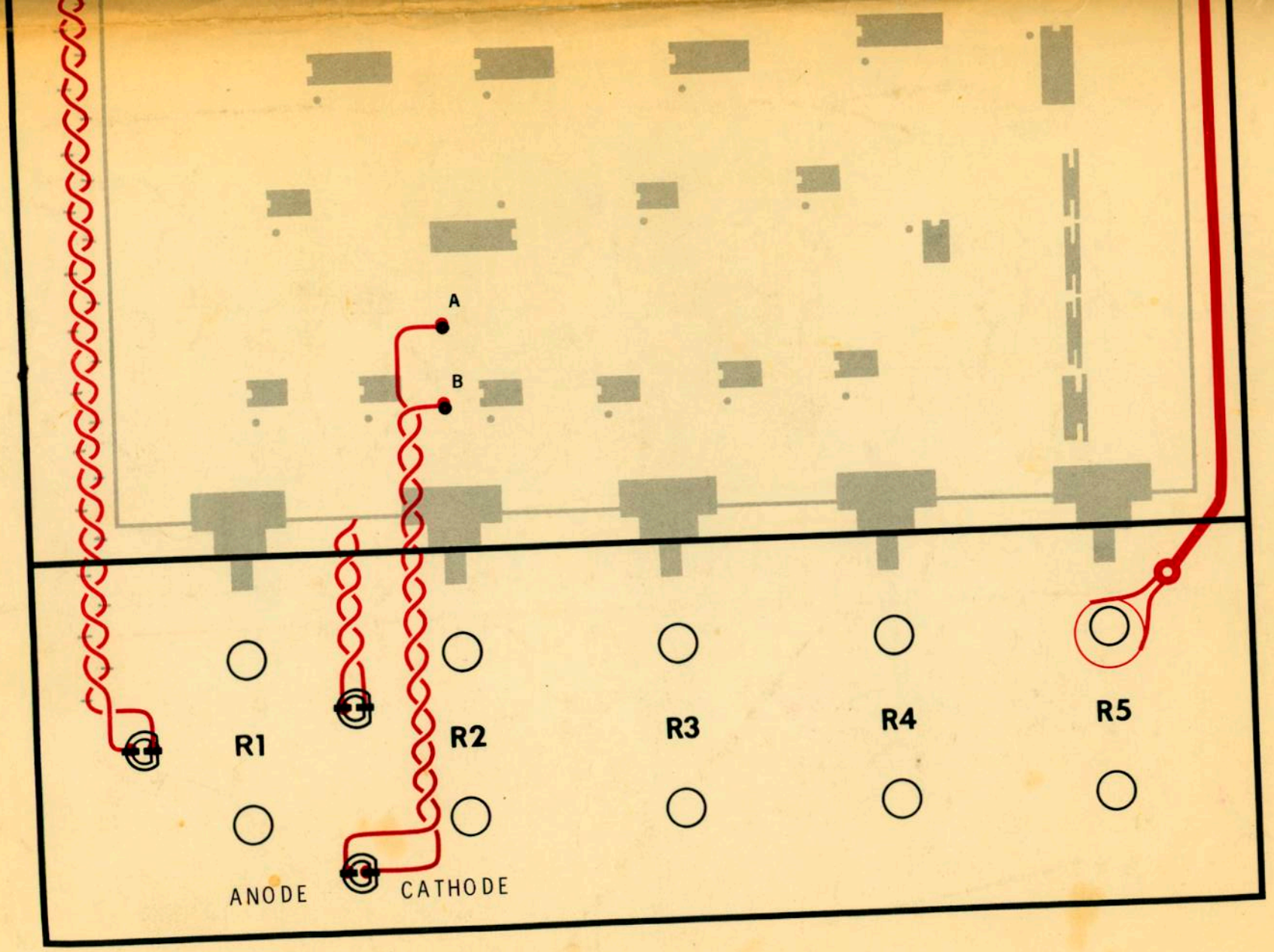


100NS = 0.1 uF ceramic
1 uF dipped tantalum
4.7 uF dipped tantalum

470 pF poly
500 pF poly
820 pF poly
2200 pF ceramic
3000 pF poly
3300 pF poly
8200 pF poly
9100 pF poly



-12v
+12v
GND
+12v
GND
7" blue
7" blue
7" white
7" blue
7" white
PUT
DEX
OSS MIX INPUT
OSS MIX OUT
LTAGE CONTROL
TPUT
VERB OUT
LTAGE CONTROL
10" red
2" brown
2" white
8" bk/white
8" bk white
8" brown
5" red
-12v
+12v
GND
+12v
GND
blue
blue
white
blue
white
T1
F1
S1
S2
C1
C2
J1
J2
J3
J4
J5
J6
J7
J8
J9
J10
7A
6A
1A


A
B
R1
R2
R3
R4
R5
ANODE
CATHODE

2AS/A Addendum

1. Interchange R30 and R31 as shown on the overall schematic. They are correct as shown on the circuit board and parts list.
2. Change R1 in the **power supply** parts list from 2.7Ω to 2.7KΩ.
3. On page 3, step 6, of the instruction set, 4 of the 5 trim pots are mislabled. Change R45, R46, R47 and R48 to R50, R51, R52 and R53 respectively.
4. The power transformer is not a 12VCT unit as stated in the parts list. The transformer, secondary when rectified and filtered, provides approximately ±15V.
5. Should the output stage (½ IC5) in either or both channels of your 2AS/A oscillate at low settings of the output level control, change R31 from 1K to 22K. This reduces the range of output level variation but suppresses the tendency to oscillate.
6. Remember, if you need short delays for chorus, flanging, or vibrato effects you will need to turn the 5/6 and 6/6 mode mix pots "OFF" and turn the 4/6 mode mix pot fully "ON" (fully clockwise rotation). For ambience synthesis, a more general mix of 4/6, 5/6 and 6/6 delays is desirable.
7. On page 13, the connector wiring pictorial shows the labels for the two Molex connectors incorrectly. The power supply connector should be labeled KA and the input/output connector should be labled KB.

NE570 NE570

8/13/79

James M. Green
525 Cypress St.
Dixon Calif.
95620

Dear Sirs

Recieved my 2 AS-A ambience synthesizer built it and am throughly enjoying what I can do with it thank you. I found that a 0.1 uF capacitor was missing which I purchased along with sockets for all the IC's. I took all precausions described in your instrustions grounding myself and where the IC was to be placed and the unit worked but I noticed distortion in one channel, after switching the IC11 a NE570 dual compandor from one board to the other the distortion moved from channel one to channel two. So would you send my another NE570

so I could clear up this distortion and really enjoy my unit.

I agree that this unit is better than 4 channel sterio.

When can I expect you to market a good noise reduction system possibly computorized and really clean up tapes records and tuners?

Thank you

James McGreen

18957

Southwest Technical Products Corporation, 219 W. Rhapsody, San Antonio, Texas 78216

NAME James M. Green
(FIRST NAME) (MIDDLE INITIAL) (LAST NAME)

Rural Route _____ Rural Box No. _____ P.O.Box No. _____

Street Address 525 Cypress St.

City Dixon State Calif.

Date 6/1/79 ZIP 95620

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P		D	UPS	BUS	AIR	SPD	PAL	MFT	MO	CCK	MC	CHK	COL	SPL	
C		F	PP	REA	SPH	CM	SAM	SPL	CSH	CHX	BAC	TOD	PO		

HOW MANY	CATALOG NUMBER	NAME OF ITEM	PRICE		TOTAL PRICE Dollars	Cents
1	2 AS-A JUL. 9 1979	Ambience Synthesizer	250	00	250	00

SEND MONEY ORDER OR CASHIERS CHECK ALL OTHER CHECKS WILL CLEAR BEFORE SHIPMENT

A B C D E F G H I J K L M N O P Q R S T U V W X Y Z
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INPUT LEVEL

CIRCULATE

SS MIX IN

INPUT

C1 1uF

R2 10K

R3 10K

R10

R8 100

R1 50K

R7 27K

R6 10K

R11 10K

R12 10K

C2

C3

C4

C5

C6

C7

C8

C10

C11

C12

C53

C55

C56

R13

R14

R15

R16

R17

TL082 1/2 IC1

TL082 1/2 IC2

A

B

D

θ_1

θ_2

R100

C60

R101

R102

R103

R104

R105

R106

C67

C68

R107

R95

C65

C64

R96

C66

R98

R99

R97

C63

R92

R93

R88

C59

BIAS

14,3 10,8 11 15 1/2 IC16 1,4,13,16 12

7,9 5 2 1/2 IC16 6

TL082 1/2 IC10

R78

C57

R80

C49

R77

R76

R79

R81

R82

C58

R67

C45

R72

R68

R66

C43

R62

R65

R63

R61

C40

R71

C46

14,3 10,8 5 2 1/2 IC14 1,4,13,16 6

7,9 5 2 1/2 IC15 6

TL082 1/2 IC9

TL082 1/2 IC8

C36

C32

C33

C24

C31

R41

R40

R37

R43

C37

R36

R35

R44

C23

C22

C21

R34

R32

R33

R38

R39

C35

C34

C36

TL082 1/2 IC6

TL082 1/2 IC5

CLOCK

R54

C29

R57

C28

R56

IC12

16 3 6 7 11 12 9 14 4 5

IC13

3 2 14 15 θ_1 TO IC14 θ_2

5 4 11 12 θ_1 TO IC15 θ_2

7 6 9 10 θ_1 TO IC16 θ_2

8 1

R58

DELAY TIME

R5

R108

PIN 9 KB

S2

EXTERNAL VOLTAGE CONTROL INPUT

C39

R28

C52

R89

R91

C62

C61

R19

R18

C13

R20

C14

R23

R24

R21

C15

D2

R27

R22

R25

C16

R26

Q1

LED

D1

R94

BIAS

LEVEL SENSOR

NE570 DUAL COMPANDOR 3 13 5 2 1/2 IC11 7 6 1 4

TL082 1/2 IC3

TL082 1/2 IC4

R87

R83

R84

C47

R74

R75

C48

R85

R86

C44

14,3 10,8 11 15 1/2 IC15 1,4,13,16 12

TL082 1/2 IC9

R64

C42

R59

R69

C41

R60

MODE MIX

to +12 volt A supply

to +12 volt D supply

to -12 volt supply

7,9 11 15 1/2 IC14 12

TL082 1/2 IC8

R70

R71

(13)

6/6

5/6

4/6

R53

R52

R51

R48

R47

R46

C38

C27

R42

C26

C30

TL082 1/2 IC7

C

OUTPUT LEVEL

R31

R30

R4

C20

C17

DELAY OUT

TO PIN 6KB

TO PIN 4KB

C50

C51

C19

R90

R-30

R31

NE570 DUAL COMPANDOR 14 10 15 1/2 IC11 11 16 4 12

REVERB

R45

R49

R50

REVERB OUT

TO PIN 7KB

INPUT

FROM PIN 1KB

C25

R55

AMBIENCE SYNTHESIZER 2AS/A SCHEMATIC
ONE CHANNEL SHOWN